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Research Progress of Water Disaster Investment at Home and Abroad

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Abstract

Water disaster is always one of the most serious natural disasters in China. The greatest social losses and threat is from water disasters, especially floods and droughts. In this background, this paper does a literature research, which aims to give a whole research status at abroad and home. Finally, it will do literature evaluation about the literature review.

Keywords: Water disaster; Emergency; Financing; Investment

1. Introduction

China is one of the countries in the world with the most serious natural disasters. The greatest social losses and threat is from water disasters, especially floods and droughts. According to statistics, since 1990, the national average loss of floods and droughts are respectively about the same 2% of GDP [1]. By the end of August 2010, cities in the country which has suffered floods have been over 200[2]. Additionally, the drought is one of the biggest natural disasters in China currently. The last three years, areas covered and affected by drought is 54655, 28982 thousand hectares, which are both more than 31615, 13842 thousand hectares by flood. But, the current situation shows that there is a big contradiction between the seriousness of the water losses caused by disasters and the imperfection the existing investment and financing system.

From the point of domestic and international experience, establishing water financing platform and guiding social capital to enter water may be an important way to resolve the contradiction. Therefore, researching on water disaster financing at home and abroad is of great significance to launch the field of social capital financing water disasters, promote the overall management of water disasters, and accelerate the economic and social development.

2. Summary of the Domestic Research

At present, the domestic scholar of water-related investment and financing (such as small irrigation and water conservancy facilities and underground water irrigation, etc.) has had some research, such as Zhang Linxiu [3], Wang Jinxia[4] and so on. However, there is few systemic study which focuses on the theory and mechanism of water disasters investment. Some viewpoints could be seen from the research cause of drought or flood academically. Domestic scholars has almost agree with water disaster investment and financing need to establish the capital mechanism that government plays the main role, also guides financial institutions and social capital into the financing[5-6], but the research angle are various as follows:

The first perspective is from the reasons of flood and drought hazards. ①Liu Tao[7] believes that, in recent years, the essential reason of national continued drought is "governability drought" caused by governance predicament of grassroots organization. ②Zhu Yeyu and Pan Pan[8] study the Henan drought from the perspective of climate. They believe

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that the main reason for the lack of water in Henan Province is the uneven distribution of precipitation, warm and cold air could no longer be the intersection of the Huang-Huai River Basin. ③Wang Shupeng and Zhang Yunfeng[9] believe that, from the fall of 2009 to May 2010, severe drought in Yunnan Province mainly due to the lack of small irrigation facilities, low construction standards, the absence of management and investment and the irrational investment structure of the national and local irrigation and water conservancy[10]. ④Gong Qianwen and Guo Linan[11] adopt statistical methods to analyze the reasons of "southwest drought", including natural and anthropogenic factors, and fixed utility model to test natural factors and human factors. Finally, they find that southwest water scarcity is a "man-made".

The second perspective is from emergency management. ①Learning from the research achievements of city natural disasters from emergency capability evaluation, Liu Xueying[12], based on the disaster management cycle theory and the characteristics of Zhejiang water resources disasters, creates disaster emergency capability evaluation index system, and gives the corresponding value of the weight of each index, which of the purpose is to improve the relevant government departments of water conservancy disaster management level. ②Zhang Guangxiu[13] thinks that we should perfect the construction of farmland irrigation and water conservancy and drought emergency management law system, the drought and flood disaster government financial compensation mechanism in irrigation and water conservancy facilities construction.③ Zhao Donghai and Qu Haiyan[14] study emergency management organization and command of the extreme drought hospital medical rescue. ④Tao Peng and Tong Xing[15]study the existing failure phenomenon of emergency management facing the drought this natural disaster, and analyze risk management, risk distortion, the relationship between organization structure and the government etc.

The third angle is from the perspective of hazard assessment. ① Li Fen and Yu Wenjin[16] figure that existing drought assessment study focus on a single species of drought disaster for agricultural drought, which lacks of a simulation study of the drought on the environment, social and economic effects. ② Liang Shumin[17] uses geographic information system, combined with the fuzzy math and analytic hierarchy process, to evaluate the drought of rain-fed agricultural areas in China to resist potential to assess the degree of drought resist potential and drought risk rain-fed agricultural areas of drought grade. ③ Qiu Lin and Wang Wenchuan[18] grade the interval boundaries values of agricultural drought vulnerability assessment in Hengyang City based on variable fuzzy set, and propose multi-level agricultural drought vulnerability of quantitative assessment of multiple indicate or variable fuzzy analysis method. ④Li Senyan, Zhu Xiaoyan[19] establish a flood disaster quantitative analysis model by using matter element extension method, indicators of floods disaster response, and analytic hierarchy process method. ⑤ Tian Yugang and Tan Donghua[20] express flood risk as results of the average annual disaster losses and terrain hazard together, put forward to the threshold method based on the data field and flood risk level of , and apply it in a flood risk assessment of the Dongting Lake. ⑥Shi Yong and Xu Shiyuan[21] analyze variation of Shanghai suburb of agricultural flood vulnerability based on the CCR envelopment analysis input-output model. The results show that the method is reliable scientifically.

The fourth angle is from the view of investing and financing water disasters. ①Yu Xiaoling[22] analyzes the current situation of the central and local governments in water disaster, build game model to study the decision-making behavior of the investment share, and finally put forward to countermeasures of water disaster fund. ②Liu Juan[23] estimates the flood and drought hazard rate of provinces and regions by the hazard rate of flood and drought affected, the standard variance of rate and the hazard rate, water conservancy investment annual growth rate. He draws the conclusion: in recent years, increasing investment in water conservancy, but the water investment is used for the defenses of the flood of investment, neglecting the management of drought.

The fifth angle is from the view of the relation between water conservancy investment and the national economy. ①Combining the latest in 2007 China input-output table and water conservancy social accounting matrix multiplier model, Tang Wenjin and Xu Xiaowei[24] research on drawing effects of China's economic investment large-scale water conservancy, and the results show that the water conservancy investment will produce larger drawing effects on national economy, especially the department of agriculture. Different investment increases the department of water to the national economy of the specific and pulling effect quite different. Water conservancy investment on China's GDP average multiplier is about 1.3. Based on the structure of water conservancy investment decomposition, the author estimates that 400 billion yuan of water conservancy investment will bring the GDP growth 492.5 billion yuan. ②Wang Caijun and Shao Dongguo[25] established the dynamic macroeconomic simultaneous equations including the lag variable, put forward the dynamic multiplier analysis method of economic effect of water conservancy investment, and analyzed quantitatively the national economic output water conservancy investment multiplier effect and its function process with the Yellow River as the background. ③Su Mingzhong[26] analyzes that how the water conservancy investment promote the macro economy development with the qualitative analysis model.

The sixth angle is from the view of the structure and mode of water financing. ①Zheng Chuiyong[27]explored all financing kinds of water conservancy infrastructure projects at home and abroad, studied a variety of financing operation of the practical problems and possible policies and regulations problems in abroad, and introduced emphatically TOT

financing, BOT financing, and ABS financing securities. ②Chen Hongyan, Pu Hua and Chen Jianjun[28] respectively do value analysis and feasibility analysis about PFI model used in water conservancy construction, and pointed out that carrying out the PFI financing should correctly deal with the relationship between government and market, complete the legislative work, play a role of the price mechanism, and pay more attention to risk management and the research and promotion of PFI. ③Xu Liping[29] analyzed the feasibility of using BOT in water conservancy project, and explored the specific operation method of the BOT financing way in China, and pointed out that the most important issue of the way to adopt BOT financing is facing the government is how to develop a strategy to encourage the private sector to water conservancy investing infrastructure project.④Zhang Wang[30] thinks that, according to new mode of water financing, innovative financing channel of water conservancy, besides continuing to expand government public finance investment scale outside, still must be guide financial institutions to finance, construct a new financing platform financing, and attract public participation in social capital into investment cooperation.

3. Summary of the overseas research

The academias abroad mainly are from the following points of view:

The first point is theoretical research investment and financing of water-related disasters. Lots of research believes that water disaster response and facilities should be vested in the areas of public goods which provides a theoretical basis for the investment and financing of water-related disasters. James M. Buchanan, Ronald H. Coase, Sanjay Pradhan, Mancur L. Olson, Wallace E. Oates[31] elaborate the supply of public goods theory from Different aspects, especially Lester C. Thurow[32] think the question of the study is not a simple choice problem between private investment and public investment, but need to establish effectively a complicated system including control management, cooperation, competition and public and private investors, in order to provide low cost efficient infrastructure service system. American political economist Vincent Ostrom and Elinor Ostrom[33] expressed the same point of view, definitely put forward to change the single center management mode that the government is the public domain of monopolists, and set up a multi-agency management mode including government, market and society under the framework.

The second point is the water conservancy construction investment and financing way research. Foreign investment subject of water conservancy construction is mainly the government, private and financial institutions. The government as the main body of investment water conservancy construction of main is a large irrigation and water conservancy, like the United States, India, Japan and other countries [34]. Mark w. Rosegrant, Mark Svendsen[34] think that the government assumes farmland in water conservancy construction. On the one hand, private capital also should participate in irrigation and water conservancy construction. On the other hand, it increases competition and reduces the cost[35], and can promote water conservancy system of financing sustainable development. Therefore, private capital investing in irrigation and water conservancy is feasible. More and more the private capital invests in irrigation and water conservancy construction. Except the government and private capital, Alma d. Porciuncula[36] points out that the financial institutions should participate in water conservancy construction and promote water conservancy construction combining with the government investment. The diversification of the main body of investment strengthens the investment market's energy and reduces the pressure on the government. But irrigation construction still cannot leave the political and economic support [37]. Hugh Turral[38] expressed similar ideas, and further points out that it is needed to invest water conservancy more accurately for the agricultural ecological and economic environment in the future.

The third kind of Angle is the financing model of water conservancy facilities. Kumbhare[35] put forward a simple auction model of small water conservancy facilities, which proves that investment incentives may due to different auction mechanism. This auction model has significance for how to attract private capital and social capital investment in water conservancy. Issah, Khan and Sasaki[39] expanded Harris-Todaro two department basic models, considering the financing behavior of developing countries, and points out that the infrastructure can not only improve the living standard of people, which also helps to rely on infrastructure operation agricultural industrialization. S.L. Kumbhare and Madhurima Sen[40] evaluate investment in five irrigation regions of the United States, which shows that estimation private investment on the rural infrastructure can promote infrastructure construction and management.

4. Evaluation

To sum up, the domestic and overseas scholars studied water disaster of hazard-formative reason, water disaster risk assessment, water conservancy financial input mechanism, private capital investment and financing problems in construction. They explored how the public finances and social capital promoted the construction of water conservancy on the primary, which provides a good foundation for the future research. Although domestic scholars in water disaster aspects has also carried on the exploration, but most are from the perspective of floods or drought research and make

recommendations. The research object is single and lacks systemic water disaster research. Therefore, it is necessary to do the literature review, which can provide a whole research situation for the future study.

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References

[1] Hao W., Dayong Q., Dangxian W., 2008. Research on the relationship between water conservancy and national economy, China Water Power Press, Bei Jing, China, p.33~40.
[2] Xiaotao CH., 2010, Urban Water Disasters and Strategy of Comprehensive Control of Water Disaster, Journal of Catastrophology 10, p,11~15.
[3] Chengfang L., Linxiu ZH., Rozelle S., 2007, Analysis on the influencing factors of agricultural public goods in China. Agricultural Technological Economy 2, p, 11~18.
[4] Jinxia W., Jikun H., Rozelle S.,2000, An innovation of property right in the groundwater irrigation system and its theoretical explanation, Economic Research Journal 4,p, 66~79.
[5] Hongyuan S., Zhongbin W., 2009. Profitability, and social resources involved in the reform of property rights–based on small-scale irrigation and water conservancy facilities and management issues, Chinese Rural Economy 3, p,3~15.
[6] Haifeng W., Jingpeng P., Wang ZH., 2011, The central water conservancy investment analysis of uncertainty, China Investment 8, p, 103~105.
[7] Tao L., 2011, Causes and Countermeasures of the drought in recent years, Water Resources Development Research 12, p, 28~32.
[8] Yeyu ZH., Pan P., 2011, Changing characteristics and causes analysis of drought disaster in Henan province, Chinese Journal of Agrameteorology 32, p, 311~316.
[9] Shupeng W., Yunfeng ZH., 2011, The causes and countermeasures of drought in Yunnan Province, China Rural Water and Hydropower 9, p, 139~144.
[10] Changyong W., Bojie L., Zhe ZH.,2011, The problems in the construction of water conservancy in China through the Southwest drought, Henan Water Conservancy and the South 21.
[11] Qianwen G., Linan G., 2011, Was the water scarcity in southwest China a “natural disaster” or “human-made disaster”?, China Soft Science, 9, p, 108~121.
[12] Xueying L., 2010,The construction of the evaluation index system of the emergency response capability to water conservancy disasters, Journal of Anhui Agricultural University(social science edition 19, p, 43~40.
[13] Guangxiu ZH., 2009, Great drought reflection: perfect farmland water conservancy facilities construction and drought emergency management legal system, Agricultural economy, p, 44.
[14] Donghai ZH., Haiyan Q., Quanyue L.,etc., 2010, Extreme drought hospital medical rescue emergency management and implementation,Journal of Youjiang Medical University for Nationalities, p, 956-957
[15] Peng T., Xing T., 2011, The failure to react to emergency in China’s natural disaster management and the remedy-refections on the drought in 2010 in five provinces in southwest China, Jiangsu Social Science 2, p, 22~28.
[16] Fen L., Wenjin Y., 2011, Review of Drought Disaster Evaluation, Progress in geography 7.
[17] Shumin L., 2011, Comprehensive evaluation on the drought risk of rain-fed agriculture in China based on GIS, Journal of Arid Land Resources and Evironment 7, p, 39~42.
[18] Lin Q., Wenchuan W., Shouyu CH., 2011, Quantitative estimation for vulnerability of agricultural drought disaster using variable fuzzy analysis method, Transactions of the CSAE 27(Supp.2), p, 61-65.
[19] Senyan L., Xiaoyan ZH., 2007, Studies on evaluation model for quantitative analysis of degree of water disaster by taking Shandong as an example,China Water Resources 16, p, 24~26.
[20] Yugang T., Yuanhui D., Donghua T., etc., 2011, Flood risk evaluation methods based on data field and cloud model, China safety science journal 8.
[21] Yong SH., Shiyuan X., 2011, Risk assessment of rainstorm waterlogging on old-style residences downtown in Shanghai based on scenario simulation, Journal of natural disasters 3
[22] Xiaoling Y., 2011, The prevention and control of water disasters capital investment research, Local finance research 12, p, 8-10.
[23] Juan L., 2006, Agricultural flood and drought and water conservancy investment correlation analysis, Shandong water conservancy 6, p, 9-12.
[24] Wenjin T., Xiaowei X., Guihua X., 2011, On the stimulating effect of large-scale water conservancy project investment on China’s economy based on the analysis of water conservancy social accounting matrix, Contemporary Finance and Economics 11, p, 20~29.
[25] Caijun W., Dongguo SH., 2002, Research on the Elastic Analysis Model of Economic Benefit of Water Project Investment, China Rural Nater and Hydropower 7.
[26] Mingzhong S., 2007, Water conservancy investment and macroeconomic development relations research, The theory monthly 1, p, 86-88.
[27] Chuiyong ZH., 2002, Research on water conservancy project financing mode, Journal of Economics of Water Resources 5
[28] Hongyan CH., Hua P., 2003, PFI: Water conservancy financing mechanism, Journal of Economics of Water Resources 2
[29] Liping X., 2005, The Application of BOT Financing Mode to Water Conservancy Project Journal of North China Institute of Water Conservancy and Hydroelectric Power 2
[30] Wang ZH., 2010, Water investment and financing mechanism:exploration and innovation, China Water Resources 14.
[31] Wallace E. O., 1988, On the measurement of congestion in the provision of local public goods, Journal of urban economices 25, p, 85-94.
[32] Lester C. T.,1971 , The Income Distribution as a Pure Public Good, Quarterly Journal of Economics 2, p,327-36
[33]Vincent O., Elinor O., 2004, Ostrom and Ostrom on the Quest for Meaning in Public Choice, The American Journal of Economics and Sociology 1, p, 105-147.
[34] Mark W. R., Mark S.,1993, Asian food production in the 1990s: Irrigation investment and management policy, Food policy, p, 13~32
[35] Kumbhare S.L., Sen M., 2008, Investments in irrigation projects-an impact analysis, Agricultural Economics Research Review 21, p, 377~385.
[36] Porciuncula A., 2009, Creative financing solution for water supply and sanitation in the Philippines, Ocean & Coastal Management 52, p, 375.
[37] Smith E., Andrew S., Water first: Apolitical history of hydraulics in Vietnam’s red river delta.Australian Library Collection, 24945764.

[38] Turral H., Mark S., Faures J. M., 2010, Investing in irrigation: Reviewing the past and looking to the future. Agriculture Water Management 91, p, 552~553.
[39] Issah I., Khan T. Y., Sasaki K., 2005, Do migrants react to infrastructure between urban and rural areas development of an extended harris todaro model, Review of urban &Regional Development Studies 1, p, 68~88.
[40] Kumbhare, S.L., Sen M.,2008, Investments in irrigation projects - an impact analysis 21.